

Recycling as the mechanism of ecological and economic equation of the regional development

In the article the role of recycling as the mechanism of the ecological and economic equation of the regional development is considered. The concept of recycling is proved; the problems, conditions and factors of its development are explored. The measures of recycling waste products from production and consumption are analyzed; recommendations on the recycling development in the region (including the organizational economic mechanism) are given.

Recycling, the system of recycling consumer wastes and residuals, eco-economic balance of the regional development.



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The need of practical reconsideration of the strategy of the regional development has appeared for the recent decades in connection with understanding of the fact, that disproportions in reproduction are connected, mainly, to the infringement of balance between economic development and preservation of the natural capital.

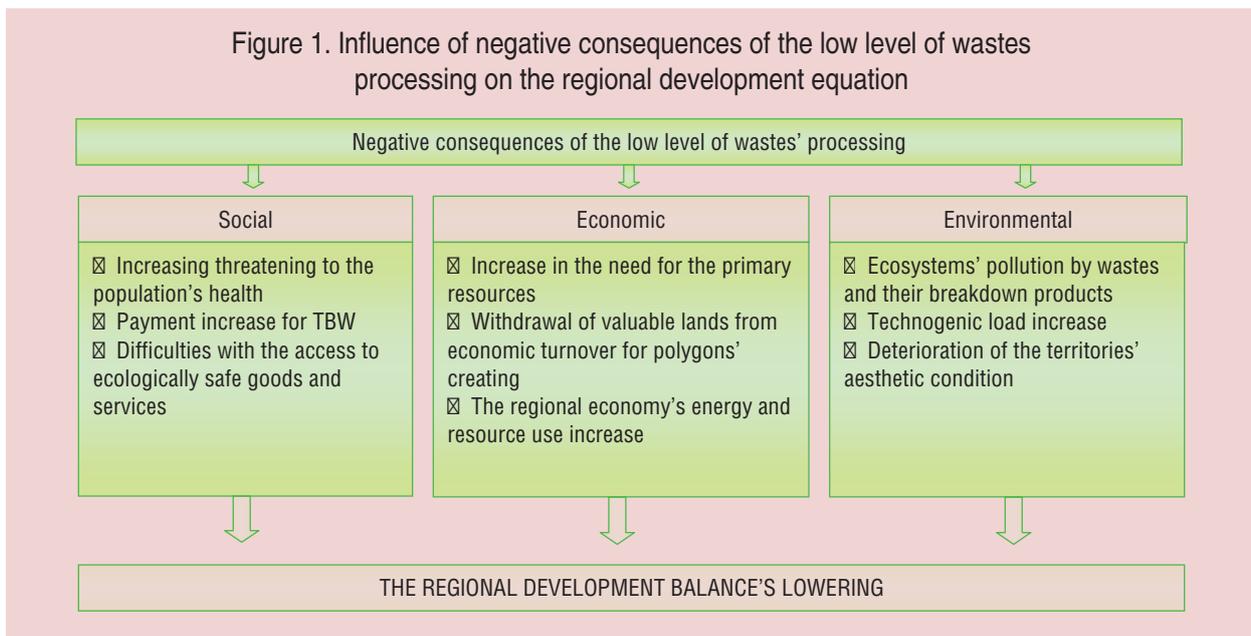
One of the main ways of this balance's preservation is maximal account (within the frameworks of knowledge existing nowadays) of ecological factors in the decision-making mechanisms of the regional development. It leads to the necessity of interrelation and interconditionality of the regional ecological policy with economic, scientific and technological, social, and demographic policy in the perspective of formation of the unified ecological and economic policy of the regional development. The efficiency of such policy's realization nowadays determines productivity of the transition to a steady socio-economic and ecological regional development [1].

For the recent decades the world community has begun to pay the increasing attention to the decision of the environmental problems, the rational use of the natural resources' potential of the region, the recycling development. Legislatively in foreign practice the established toughening of the requirements to production and services has served as stimulus to the formation of the demand for the environmental technology, non-polluting goods, and investments into environmental industry, and to the active development of business on waste products' processing (recycling).

Recycling is possible to be defined as the system of the organizational, economic and technological actions on returning production and consumption wastes into the repeated economic circulation.

The necessity of the recycling development as the mechanism of the ecological and economic equation of the regional development is caused by negative consequences arising from the wastes' influence on the environment at the low level of their processing (*fig. 1*).

Figure 1. Influence of negative consequences of the low level of wastes processing on the regional development equation



The analysis of the modern recycling condition in the regions of the Russian Federation allows allocating the basic problems of its development:

- ☉ absence of the active state support of recycling;
- ☉ inefficient legal base;
- ☉ inefficient control system in the sphere of recycling in the regions;
- ☉ undeveloped infrastructure in the sphere of waste products' recycling;
- ☉ liquidation of the reception points of the population's waste products;
- ☉ absence of economic stimulus of involving wastes into the repeated economic circulation;
- ☉ low level of inter-regional interaction;
- ☉ insufficient influence of the public and professional associations on the decision-making by the state and municipal authorities in the sphere of the production and consumption wastes' recycling.

The recycling development in the Russian regions is of great importance in connection with the current situation with waste products from production and consumption.

In the territory of Russia more than 85 billion tons of waste products has accumulated [8].

According to the data given by the Association of recycling, annually in the country more than 3 billion tons of the industrial wastes, more than 40 million tons of the firm communal wastes, 3 million tons of the medical wastes are formed. Especial danger is represented by the toxic waste products, the rates of their formation in Russia (15 – 16% a year) outstrip the dynamics of the gross national product [13].

For example, the formation of wastes of production and consumption in the subjects of the North-West Federal District of the Russian Federation is characterized by the following data (*table*).

As the table shows, from 2004 to 2009 the growth of volumes of wastes' formation has been fixed in such subjects of the Russian Federation as Karelia Republic (3.81%), Arkhangelsk Oblast (86.27%), Kaliningrad Oblast (3.57%), Leningrad Oblast (7.56%), Murmansk Oblast (29.99%), Pskov Oblast (66.67%) and Saint-Petersburg (18.31%). The reduction of the mentioned parameter has taken place in Komi Republic (-55.48%), Vologda Oblast (-5.49%) and Novgorod Oblast (-25.53%). On the whole in NWFD for the same period the growth of wastes for 17.74% has been observed.

Formation of the production and consumption waste products in NWFD, thousand tons [4, 14]

Territory	2004	2006	2007	2009
North-West Federal District	246000	332125	361148	289630
Karelia Republic	70030	101729	106379	72700
Komi Republic	11680	16715	6570	5200
Arkhangelsk Oblast	5100	10686	22501	9500
Vologda Oblast	16400	21410	17922	15500
Kaliningrad Oblast	560	390	281	580
Leningrad Oblast	1190	1759	1636	1280
Murmansk Oblast	140700	176985	202849	182900
Novgorod Oblast	940	914	945	700
Pskov Oblast	120	112	206	200
Saint-Petersburg	710	1424	1857	840

The great amount of the consumption wastes concentrates at the polygons and numerous non-authorized dumps which are the dangerous sources of air pollution, soil contamination, and cause harm to plants, underground and superficial waters. So, according to the data of the Rosprirodnadzor, in Russia by the beginning of 2010 23 963 objects of wastes' accommodation were taken into account (only 8% of the objects of wastes' accommodation meet to the established requirements), from them 11 193 are non-authorized dumps which constantly extend.

The special problem is an uncontrolled disposal of dangerous wastes (for instance, medical wastes). About 80 % of these waste products are not destroyed according to the requirements of sanitary norms and rules, and some part of them are thrown into garbage containers and to the waste polygons, threatening to health of the population [7]. Among dangerous waste products, except for medical and bioorganic, pesticides and herbicides, the delayed mineral fertilizers can be mentioned (in Russia it is 75 thousand tons).

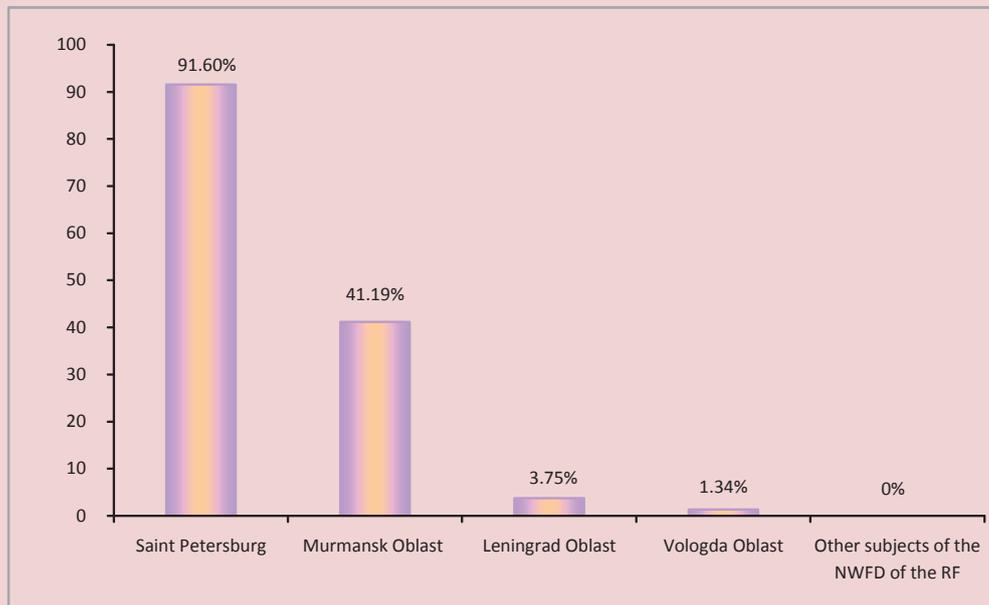
By now the advanced countries use from 50% to 70% of production and consumption wastes, planning in the long term completely to refuse using polygons. In Russia the use of the production wastes makes by different estimations from 25% to 45%, and the consumption wastes of about 2 – 5% [8, 9].

So, in 2008 in NWFD the enterprises of the production wastes' recycling only 35.71% of the total amount of the production waste products were processed (CFD – 22.8%, FFD – 4.9%, SFD – 2.6%, PFD – 2.6%, NFD – 1.9%, UFD – 0.1%), of them: in Saint-Petersburg 91.6%, Murmansk Oblast 41.2%, in Leningrad Oblast 3.7%, in Vologda Oblast 1.3%, in other subjects of the NWFD of the Russian Federation such waste products didn't come to the enterprises of processing (*fig. 2*).

In foreign practice, in modern conditions recycling is applied: in Switzerland - 23%, in Japan – 20%, in the USA – 32.4% of household waste products. In the advanced countries such method of recycling of household dust as burning is widely used. The share of the burnt household waste products in their general volume changes over a wide range: in Austria, Italy, France, Germany - from 20 to 40%, in Belgium, Sweden – from 48 to 50%, in Japan – 70%, in Denmark, Switzerland – 80%, England and the USA – 14%. In comparison with these countries in Russia the lowest level of household dust burning makes 2%.

However simple burning FHW cannot be considered as economically and ecologically expedient technology as many substances which could be used, are destroyed and thus burning requires the additional energy expenses. Besides the existing garbage-burning installations at work form secondary toxic waste

Figure 2. The densities of the taken to the enterprises of the industrial processing waste products in the total amount of export in the subjects of the NWFD of the RF, 2008



products, for example, dioxins, producing the destroying influence on the human hormonal system that in a result leads to the reduction of the human potential in the region [2]. Garbage-burning factories represent special danger for the northern regions where their operation can especially result in degradation of the vulnerable ecosystems. Hence, the recycling development as more ecologically safe in comparison with burning, should become a prime measure in the increase of the environmental and economic equation of the regional development.

It is necessary to pay the special attention to the problem of recycling firm household waste products (FHW) having the greatest heterogeneity both on morphological structure of waste products, and on the territory where these waste products are formed. The inefficient system of gathering and sorting FHW in Russia leads to the low level of extraction of useful fractions from FHW.

The important component of the recycling mechanism is restoration of places of acceptance as it allows reducing the quantity of FHW and labor input into their sorting at the following

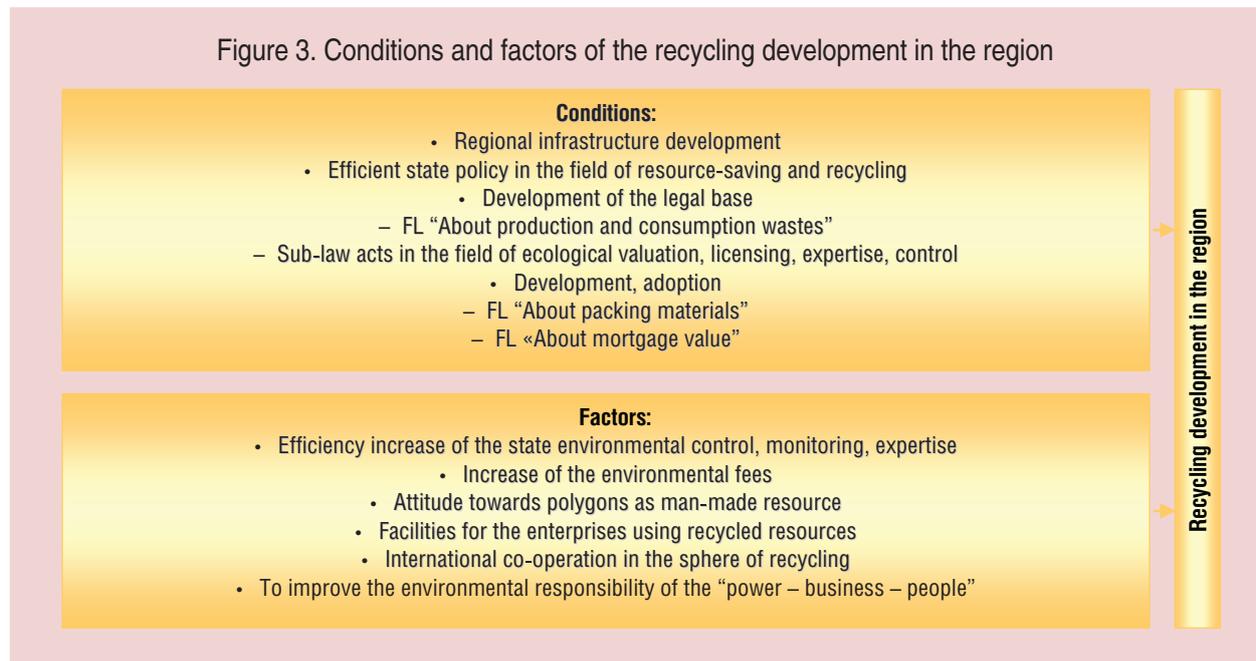
stages of processing. Such way of sorting FHW is the most economic and does not demand additional expenses for constructing sorting enterprises.

The development of the recycling industry is especially favorable and expedient now, during restoration of the Russian economy after the world financial and economic crisis. In these conditions, when there was a sharp necessity for the economy of all kinds of expenses, the use of the secondary resources provides the reduction of expenses at goods' production as involving of secondary resources into economic circulation is, as a rule, cheaper, than the initial resources.

The analysis of the current condition of FHW processing in the Russian regions allows allocating, in our opinion, the following factors and conditions of the recycling development (*fig. 3*).

Economic efficiency of recycling is caused by the following facts. The analysis of the prices for the initial and secondary plastic raw material shows, that the difference of the prices makes from 1.5 to 2.2 times: polythene – initial

Figure 3. Conditions and factors of the recycling development in the region



raw material of 50–60 rubles/kg, secondary raw material of 25–40 rubles/kg; polypropylene – initial 40–62 rubles/kg, secondary 20–30 rubles/kg.; polystyrene – initial 53–59 rubles/kg, secondary 24–37 rubles/kg.

Thus, now, the share of the secondary raw material in production from plastics makes in Russia of 4–5% [12]. At the total amount of the market of polythene in 550 000 tons a year, the annual economy for consumers of raw material can make about 11 billion rubles; of propylene - volume of the market of 783 000 tons, the potential economy can be 15.6 billion rubles; polystyrene – the volume of the market of 474 000 tons, the potential economy can make 11.8 billion rubles.

The calculations carried out in Finland, show, that at tenfold use of a glass bottle in capacity 0.34 liters of the power consumption on its one turnover from a manufacturer to a consumer and back makes 24% from the level of power inputs on the same disposable glass container of secondary raw material and 9–16% – from the level of expenses for this container made of the initial raw material. In Russia the use of 1 ton of paper for recycling saves 3.5 m³ of wood (1 million tons of paper for recycling allows to keep from cutting down 60 hectares

of woods), 1 ton of secondary polymeric raw material – 0.7 tons of the initial polymeric raw material, 1 ton of the secondary textile raw material – 0.7 tons of natural or synthetic fibers. As a result of processing 120–130 t of cans 1 t of tin can be received that is equivalent to the extraction and processing 400 t of ores, thus the power consumption on producing aluminum cans, made of the initial raw material, is three times higher, than on producing cans of the secondary raw material [3].

According to the data of the RosStat, in 2009 in the North-West Federal District it was taken 8.98 million m³ of FHW to the enterprises of industrial processing [4] from the territories of city settlements, that at their processing, at the average morphological structure of FHW for this region could make the economy of 1.25 million m³ of wood, 95 thousand tons of the initial polymeric raw material, 250 thousand tons of natural and synthetic fibers [5].

In the opinion of experts, the probable level of recycling at the scientific and technical and innovational potential in this sphere created in the Russian Federation and abroad, can reach 70–90%, and the main vector of the development is introduction of technological innovations.

Besides the investment of means into construction and operation of enterprises processing wastes will allow creating new workplaces, improving ecological conditions in the regions of Russia, reducing the areas occupied with ranges and spontaneous dumps of garbage and as consequence, and reducing negative influence of waste products on the population's health.

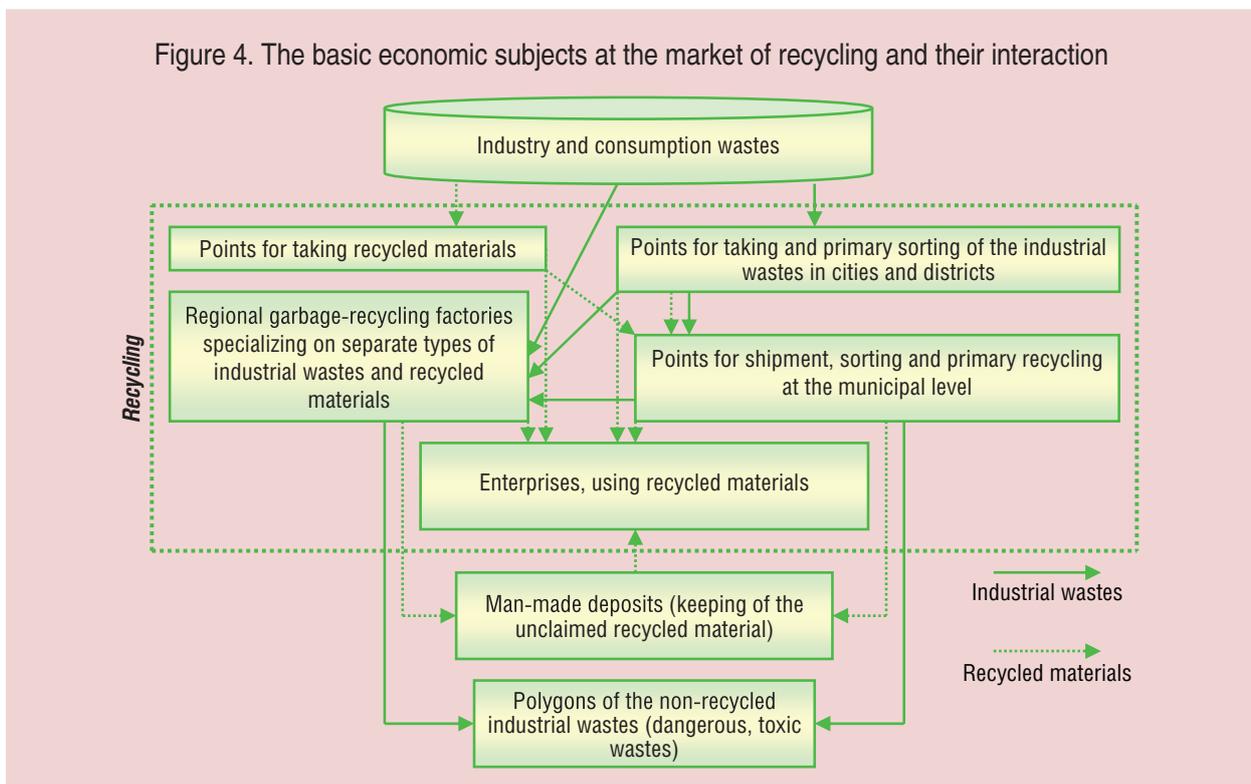
As the recycling experience in the foreign countries shows, market relations are not capable alone to adjust effective processes of wastes' processing. The majority of the EU countries solve the problems of recycling and wastes' processing by combining both state and market mechanisms of regulation. In Russia the creation of the complex regional systems of production and consumption wastes' processing on the basis of the recycling priority above other ways of use and neutralization of waste products to the most effective institutionalized innovations in the sphere of industrial and consumption wastes' processing could become.

Thus the special attention should be paid to inter-regional and trans-boundary aspects of such system's functioning. The recycling development under such scenario will result in creation in the region the industry of recycling as a sector of the regional economy. The special value for functioning of such inter-regional system belongs to the effective activity of subjects of managing, and also to the interaction between them. The basic subjects of managing in the market recycling, both the wastes' streams and secondary resources between them are submitted below (fig. 4).

For the solution of the problem of technological recycling development studying of the existing latest methods of wastes' processing, the choice of the most effective of them and the investment projects' development is important.

As to the investment projects they can be both private and private-and-state with the use of the financial resources of the region. In the sphere of recycling it is necessary to involve the private capital more actively as at the rational organization it is profitable.

Figure 4. The basic economic subjects at the market of recycling and their interaction



Thus with the purpose of the private investors means' attraction for the development and realization of projects in the sphere of recycling it is necessary for them to be given tax privileges.

Also for the improvement of the situation with the development of recycling it is necessary to improve the legal base in the field of the recycling waste products. In the developed legislative acts it is necessary to fix the mechanisms of the producers' and importers' responsibility for gathering and processing wastes after the products' use, to make up the list of production, specifications and terms of its entering into operation; to develop the mechanism of collecting and distributing of payments for producers and importers for compensation of expenses for gathering and processing of separate kinds of production and packing.

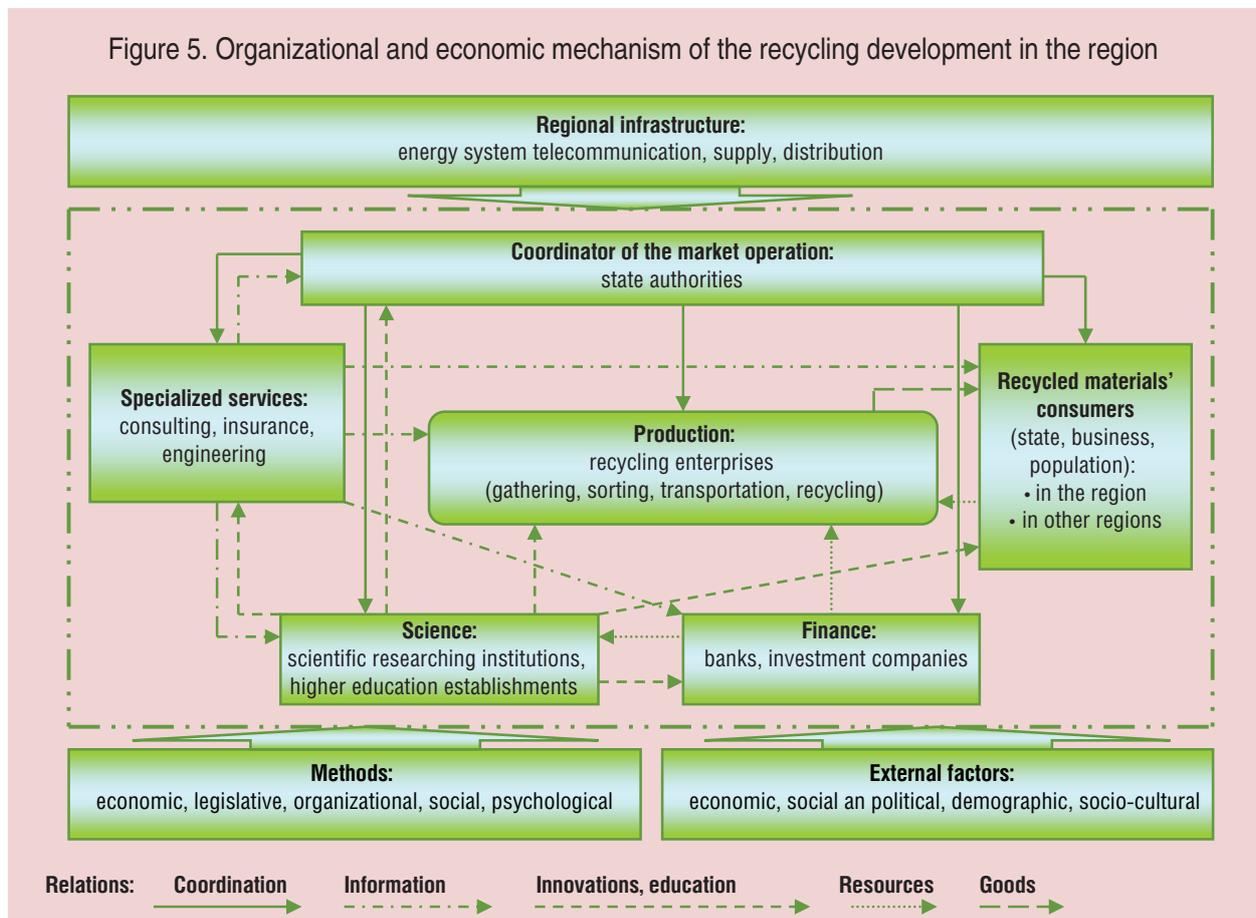
Tax and other stimulus are necessary for the organizations which are carrying out gathering of wastes from the population, ecologically safe

recycling and introducing the best technologies, introduction of the principle of producers' responsibility for ecologically safe recycling of wastes products by the end of "life cycle" of production and establishing special requirements in the sphere of the recycling medical, biological and other ecologically dangerous wastes [7].

The prospects of the recycling development in Russia are connected to the creation of the effective organizational and economic mechanism of recycling which, in our opinion, should include the following basic components (fig. 5).

For this mechanism to effectively function the following things are necessary:

- private and state investments into the research and the development in the sphere of recycling and liberalization of the tax policy for the enterprises which are carrying out such researches and development;



- increase of the state policy efficiency in the sphere of the basic researches in the field of recycling technologies;
 - liberalization of the customs policy;
 - development of the legislative base;
 - expansion of the scales of use of the effective technological innovations, including the methods of waste's processing, not providing their burning (experience of St.-Petersburg State Institute of Technology, Penza State University of Architecture and Construction, etc.) [6];
 - legislative introduction of the principle of "the best existing technologies" at the enterprises which are carrying out recycling;
 - professional training, capable both to develop the recycling technologies and to set the innovational equipment into practice;
 - use of the program approach in the recycling development at the regional level and macro-regions on the basis of inter-regional interaction;
 - development of recycling according to the principles of poly-subjectiveness and ecological responsibility;
 - development of the organizational economic mechanism.
- Thus, in the modern conditions recycling is the important mechanism of the social, ecological and economic problems' solution which importance is high, than productivity of the measures taken for their solution. In this connection the sphere of recycling should be considered as the integral component of the regional social and economic system creating the preconditions of ecological and economic equation of the regional development.

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